

# NANOOK

## BUILDING INSTRUCTIONS



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# NANOOK

Among the skin-on-frame construction methods, the traditional construction method and the fuselage frame construction method are the best known. In the traditional construction method, steam-bent ribs, usually made of ash or oak strips, are connected to the longitudinal strips and so define the shape of the hull. The fuselage frame construction method of the NANOOK is a modern form of the skin-on-frame construction method, in which frames made of plywood or multiplex replace the steam-bent ribs. Building a fuselage boat is easier to accomplish and less time-consuming.

The NANOOK kayak is based on the shape of traditional greenland kayaks and can be built within a few days or weeks, depending on your previous knowledge. You don't need a strongback for the kit, which saves you a lot of time and material costs. The kayak's shape is defined by several frames, which are placed perpendicular to the boat's axis and spread the longitudinal stringers and gunwales. The following covering with robust polyamide fabric and the varnishing with PU varnish make the wooden frame a tough and reliable kayak. If you follow my material recommendations, the kayak should weigh about 12.0-12.5 kilograms when finished! Of course, you can also decide to use a different wood or material for the skin. The kit and building instructions are deliberately kept open here.

## The Design

In the design, the focus is on low weight, but the statics are not neglected by clever material savings in the right places. The kit is designed so that it can be built with a few hand tools even by inexperienced people. The parts are already prepared with holes for knotting, only the gunwales and stringers must be cut to length and trimmed at bow and stern, which requires some manual dexterity. In addition, in this manual I describe my method of skinning a kayak, which works without a center seam and allows you to stretch the skin extremely. This is the best way to avoid the disadvantage of the polyamide skin sagging and forming waves in damp or cold weather. Another advantage of this method is that you can install my hatch system on the deck without a center seam.

## Characteristics and measurements

The NANOOK is sufficiently stable even for beginners and has a good secondary stability when angled. A structural feature allows the seat height to compete with those of traditionally built kayaks and gives NANOOK additional stability by providing a low center of gravity for the paddler. The hull has little rocker as well as a slight V-shape, so it is very true to track. The decks were kept as low as possible to give the wind little surface to attack. The flat rear deck also facilitates rolling.

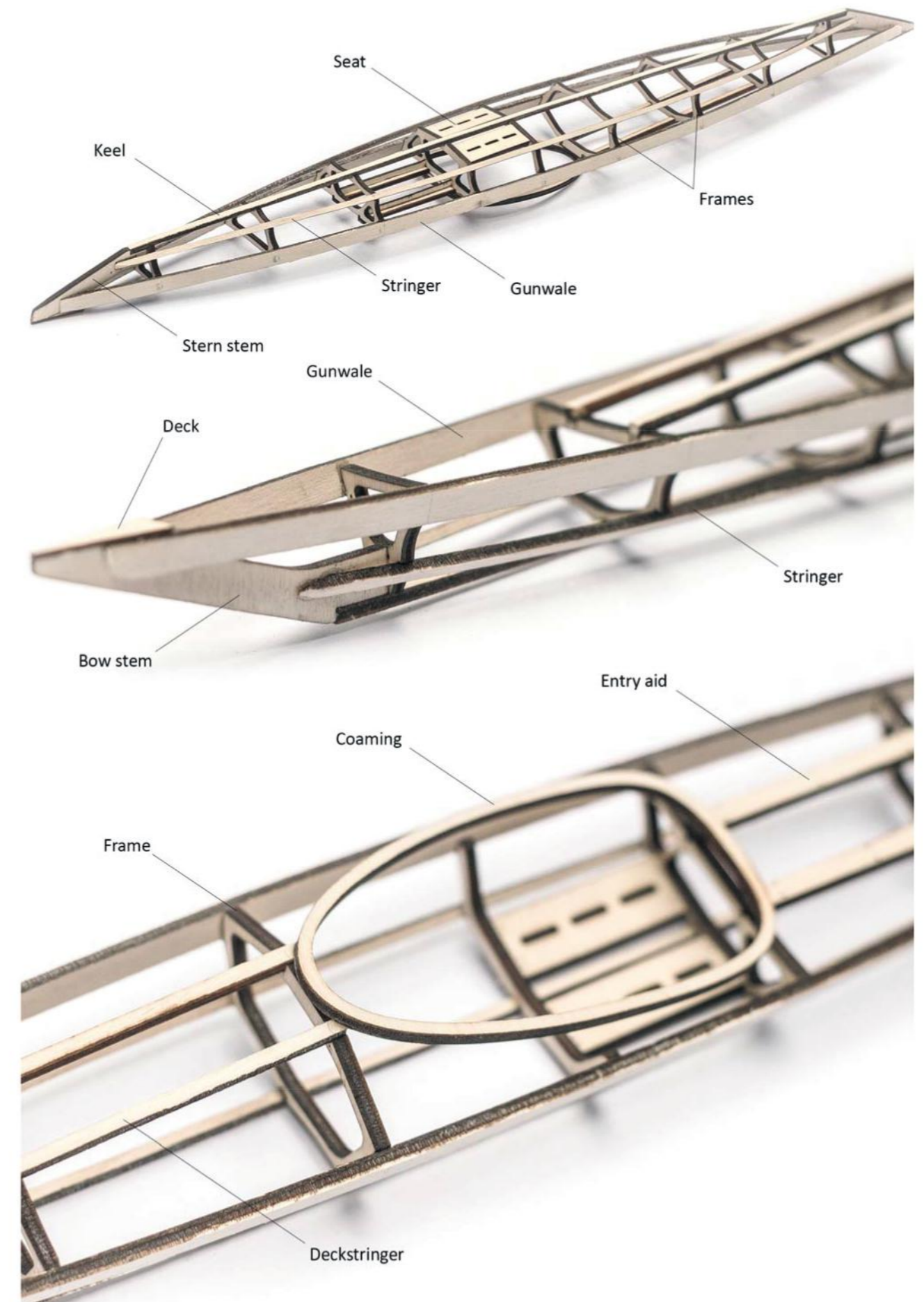
Total weight:	12,5kg	(when using the proposed materials)
Width:	55cm	
Length:	507cm	
Paddler weight:	up to approx 100kg	
Paddler size:	up to approx 190cm	
Coaming inner dimensions:	78 x 41cm	

These instructions are suitable for building according to the plan as well as for building the kit. Depending on which variant you have chosen, I point out the relevant text passages in certain sections.

I wish you a lot of fun building your NANOOK!

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Location of some technical terms on the model:



## Tapering Wooden Strips

If you can't find wood of the appropriate length, you can also make long strips by tapering two short ones. In the process of tapering, two strips of wood are glued together to form one long strip using an acute angle that increases the gluing area. There is a rule of thumb here that the length of the tapered joint should measure at least 8 times the strips thickness (e.g. for 22mm strip thickness:  $22 \times 8 = 176\text{mm}$ ). However, I recommend about 10 times of the strips thickness, which results in a tapering length of about 16cm for the gunwales and about 22cm for the stringers. The gluing surfaces are then larger and more stable, whereby strips with this more acute angle can still be processed easily.

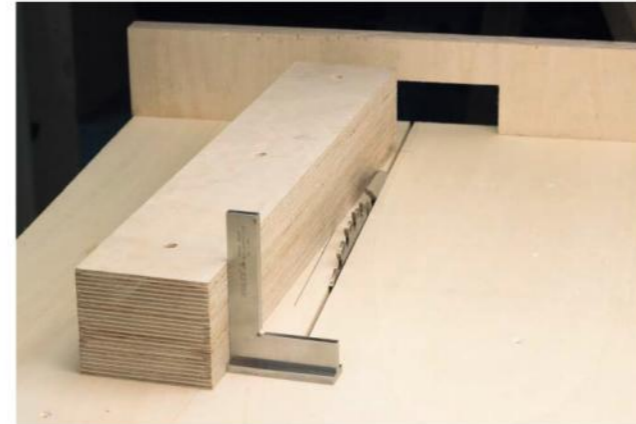
### Building a jig and sawing the taperings

To make a precise tapering that will give a straight strip, you should build yourself a jig for the table saw. The rule here is that it doesn't have to look pretty, it just has to work and, of course, be safe. It must be possible to move the jig parallel to the saw blade, for which the grooves of a table saw can be used. A board at the rear of the jig holds the base plate together as the saw blade makes a cut through it. A block of wood serves as a fence, which is screwed onto the base plate at the desired angle. It determines the angle and thus the length of the tapering. Very important: Align this block with a 90° angle absolutely perpendicular to the base plate (Fig. 1). Use screw clamps to hold the strip against the fence during the cut (Fig. 2). Be careful that the clamps do not collide with the saw blade.

### Gluing the tapering

The strips are glued with epoxy resin. The table should be covered with packing tape beforehand so that the strip will not stick to the table. The first strip is placed on the table and fixed with clamps so that the angle of the later tapering points upwards. Now position the second strip on the first one so that the angles of the joint match. Move both strips to a position where they lie flat against the table and the transition on the top of the strips can hardly be noticed with your fingers. The position of the second strip is now marked with a small pencil line that goes across the strip and the table (Fig. 3). The second strip can be removed again to perform the gluing of the joint.

The epoxy resin should be warmed (about 25-30°C) before mixing the two components to make sure it is as thin as possible and can seep deep into the wood. After carefully mixing the two components, both contact surfaces of the strips are saturated with resin (Fig. 4) and then positioned on top of each other. The second strip is placed in position on the table with the pencil mark. To make sure the resulting strip will be straight, both strips should be aligned with an aluminum lath before clamping. When this is done, both strips to the right and left of the joint are fixed to the table with clamps. This will ensure that the tapered surfaces do not slip on top of each other when you clamp them which would cause the joint to shift. Then the joint itself is clamped. A small board should be used to distribute the forces of the clamps and to protect the strip from clamp marks (Fig. 5). To prevent the board from sticking, apply packing tape to it beforehand. If you glue the joint with epoxy resin, you should not use as much force when clamping as is required with classic wood glue.



1 - Tapering jig: Aligning the fence with a 90° angle



2 – Sawing the tapers



3 - Pencil mark over second strip and table



4 - Applying epoxy resin to the gluing surfaces



5 - Gluing the taper



6 - The taper after sanding

## Installing the Frames

When installing the frames between the gunwales, the kayak lies with the keel up. Descriptions such as "upper" and "lower" edge of the gunwale are to be understood as the kayak lies in front of you. Install only frames 2 to 8 at first, as you will need to spread the gunwales out a bit at bow and stern later. Remove the clamps and place the gunwales higher in the building aids where the aids have angled cutouts for the gunwales. Then spread them out in the middle of the boat and insert the frames between the gunwales (Fig. 1). Start with frame No. 4. The keel of the frames points upwards (you can recognize this by the centrally placed notch for the keel stringer). If individual frames do not hold, you can carefully pull the gunwales together with lashing straps. When the frames are all aligned between the marks, you can start to knot them.

While knotting, you should realize the importance of strong tension on the sinew since you want to build a strong kayak with a rigid frame. Because the sinew is slightly stretchy, the tied joints are permanently fixed. This is also important to preserve the frames shape as best as possible while skinning. Thanks to the layer of wax, the sinew also adheres well to itself, which helps in keeping the tension. Wrap the sinew on a short piece of round wood, which will allow you to keep it under tension without cutting into your skin.

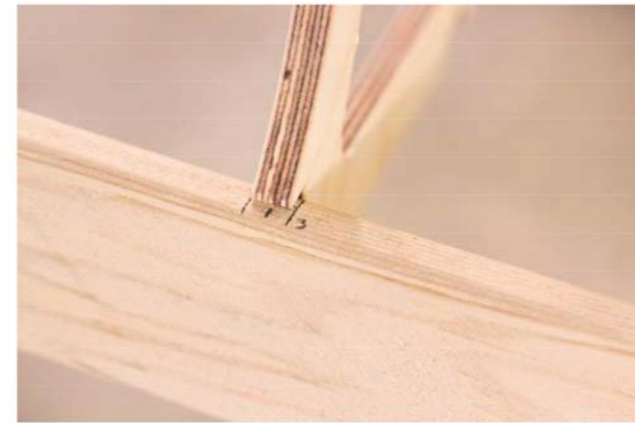
Before knotting, decide if you want to sink the sinew a bit into the strips on the outside of the hull. This means a little more effort, but the lashings won't show up as small bumps under the skin later. When paddling, it can be advantageous in case of ground contact if the sinews are recessed. To sink the sinews, use the edge of a file to make small notches in the outside of the stringers and gunwales, where the sinews then disappear (Fig. 2).

### Frames 2-4 and 6-8

First, feed one end of the sinew through the hole and the other end around the nose at the top of the gunwale and knot them together (Fig. 3). If visual details are important to you, tie this knot at the less visible point, i.e. the part of the frame facing away from the cockpit. Run the sinew horizontally to the side over the top edge of the gunwale, down on the outside of the gunwale and over the bottom edge of the gunwale back inside the boat. Then through the opening in the frame to the other side of the frame and back around the bottom edge of the gunwale to the outside of the gunwale. Now back around the top edge of the gunwale and through the opening in the frame. You are now back at the knot and repeat the previously described ways, as a double laid sinew makes the connection stronger and more resistant. Once you are back at the knot, pass the end of the sinew outward over the top edge of the gunwale and then pinch it between the nose of the frame and the top edge of the gunwale. In this way you fix the sinew and can relieve it in order to sew it up. To do this, thread a round needle through the end and guide the sinew back through the hole to the knot (Fig. 4). Here you have to secure it well against loosening. Insert the round needle behind an already laid sinew so that a loop is formed. Guide the needle through this loop and tighten the resulting knot (Fig. 5). Repeat this at least three times and then leave a centimeter when cutting off the excess sinew for safety.

### Frame 5

Frame 5 is used to hold the seat and is open at the top. Before you knot this to the gunwales, install the two seating surfaces as described on the following two pages. Frame 5 cannot be knotted with the sinew wound up like the rest of the frames but must be knotted using a needle. For this purpose, two holes are milled on each side of the frame. Start with a first knot between these two holes to secure the sinew (Fig. 6). Then guide it horizontally outward over the narrow edge of the gunwale, around the bottom of the gunwale and through the upper hole to the other side of the frame. Now again, down the inside of the gunwale, around the bottom edge to the outside of the gunwale and around the top edge (Fig. 7). Then pass the sinew through the bottom hole. You are now back at the knot and repeat the steps described earlier until you reach the knot for the second time. Now knot the sinew again as described for the other frames (Fig. 8).



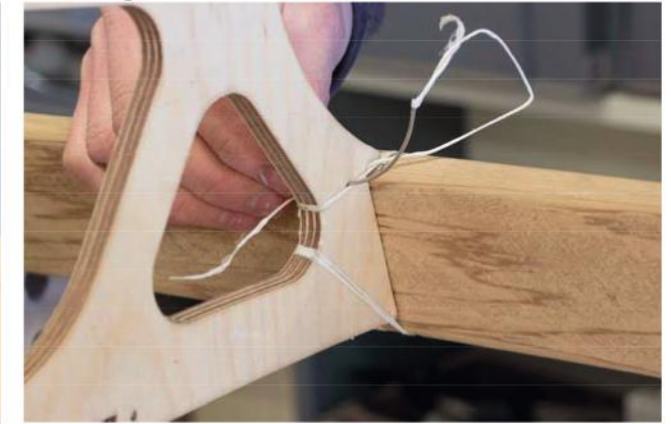
1 - Placement of the frames between the markings



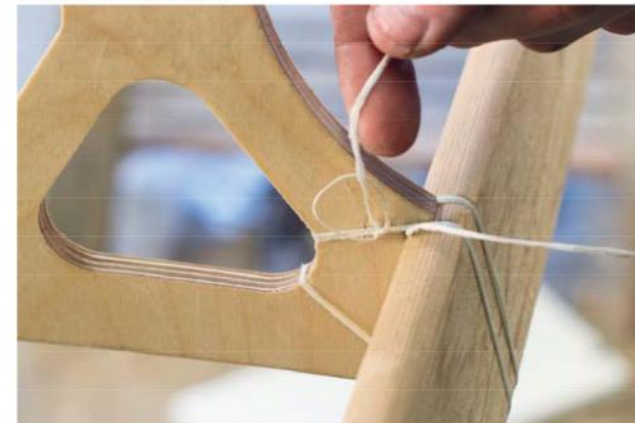
2 - Sinking the sinew into notches



3 - Start with a knot



4 - The sinew is laid like this (except at frame 5)



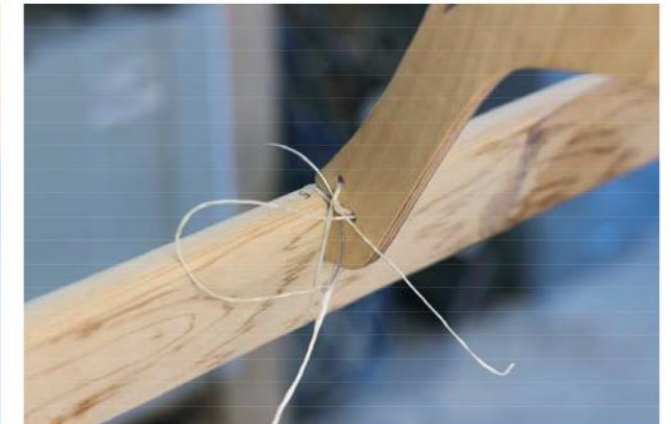
5 - Fixing the end of the sinew with a knot



6 - Frame 5: start with a knot



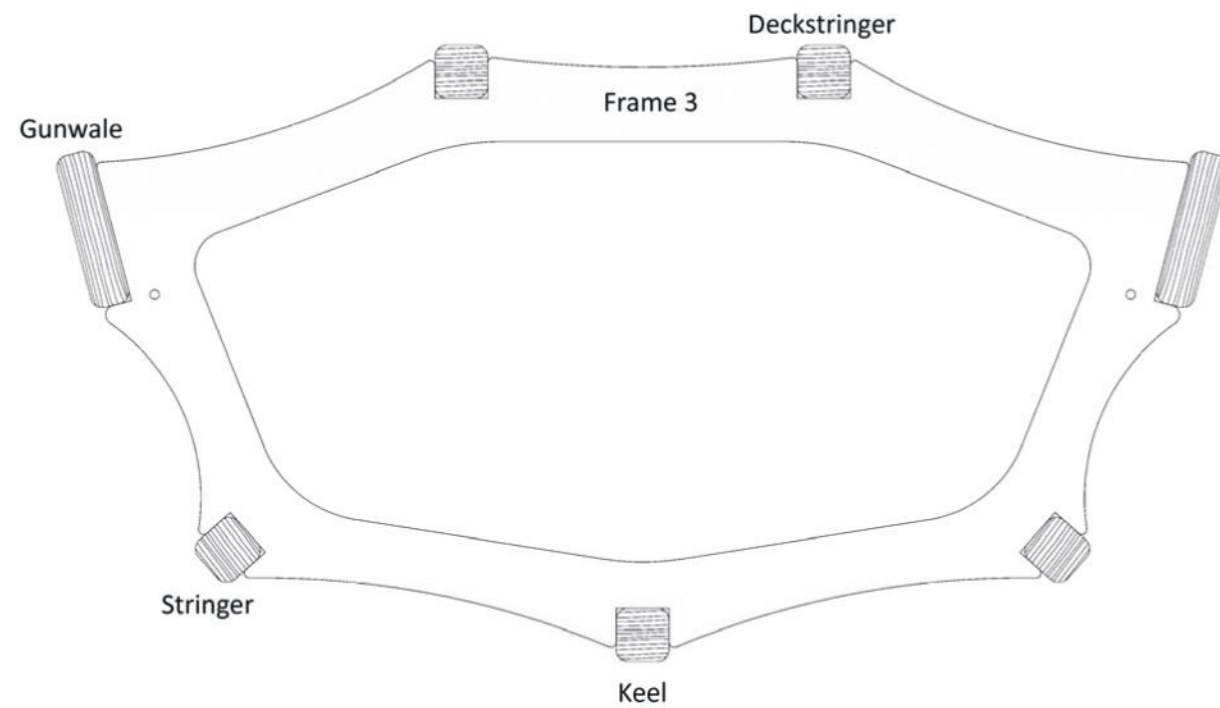
7 - Laying the sinew



8 - Fixing the end of the sinew with a knot

## Stringer and Deckstringer

The annual rings in the strips should be installed as shown in the illustration below. This way, the stringer, keel and deck stringer will flex better when they hit an obstacle, making breakage less likely.



### Deckstringer

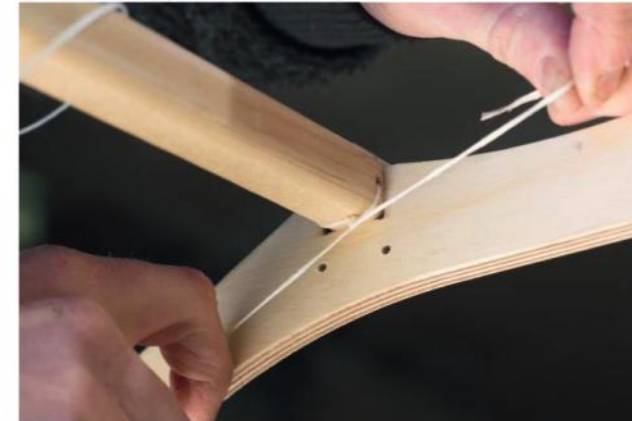
Place the deck stringers in the recesses provided in frames 2, 3 and 4. Align the end of the strip flush with frame 4 (Fig. 1) and drill a hole in the stringer on the side of the frame facing the bow (Fig. 2). Now fix the sinew as shown in figure 3 and pass it several times through the frame and the deck stringer strip (Fig. 4). Finally, pull the sinews together and put them in tension. The finished knot should look like the one in figure 5. In figure 6 you can see how the sinew is laid on the cockpit side. Now attach the deck stringer to frame 3. You don't need to drill holes here and can simply lay the sinew several times around the deck stringer and the frame. On frame 2, saw off the overhang of the deck stringer flush to the frame, drill a hole and then proceed as described for frame 4.



1 - Drill hole (you see frame 4)



2 - Drilled hole



3 - Fixing the sinew



4 - Laying the sinew and tightening the knot



5 - Finished knot



6 - Finished knot seen from the cockpit (frame 4)

## Oiling the Frame

*Caution:* Before oiling, read the "Health and Safety" section on page 8.

The frame now consists of the already oiled components and the unoled gunwales and stringers. These are now oiled with OWATROL "Decks Olje D1". If you have used Red-Cedar or another very moisture resistant wood for gunwales and stringers, you only need to do a few coats here until the wood is sufficiently protected. For other types of wood such as pine or spruce, I recommend oiling the wood until it is fully saturated. Follow the manufacturer's instructions here.

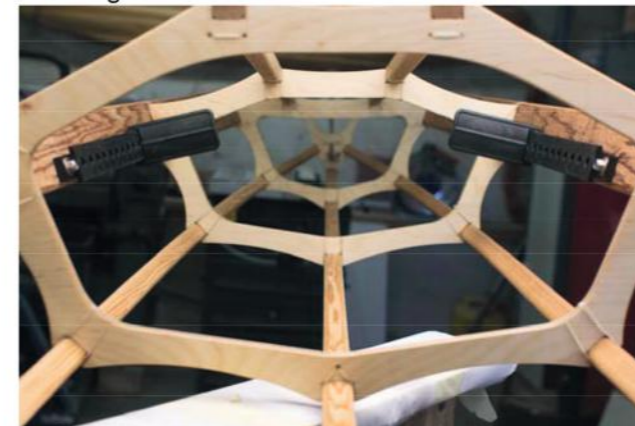
After the last oil application, remove the excess oil with a rag so that the skin is not contaminated with oil later. For this reason, let the frame dry for a few days after oiling.

## Installing the Footrests

You have to decide which footrest you want to use but I would like to show a possible solution as an example. I used an adjustable footrest (Fig. 2) and screwed it through the gunwales with stainless steel screws (V4A - seawater resistant). Since the footrests are intended for plastic boats, I had to improvise a bit and removed the glued-in lock nuts and screwed the footrests through the gunwales with countersunk screws instead. To do this, hold them in the desired position and drill through the gunwales with a 6mm wood drill bit. Countersink the hole on the outside of the gunwale so that the countersunk screw disappears flush under the skin. On the side facing the paddler, I omitted the small plastic end piece of the footrests and used an M6x30 bolt with washer and locknut (Fig. 3). This allows the adjustable footrest to still be completely removed from the rail. On the side facing the bow, I used an M6x40 bolt with washer and locknut (Fig. 4+5).



1 – Oiling the frame



2 – Installed Footrests



3 – View from the Cockpit



4 – Top view at frame 3



5 - Fastening at frame 3

## **It's a Boat!**

Congratulations! You have just finished what may be your first kayak. The feeling of paddling a selfmade boat for the first time is indescribable. Even though the NANOOK is a greenland kayak or sea kayak, you should take further precautions for your safety, as it is not possible to install bulkheads in a skin-on-frame kayak. So, you should install floating bags in the bow and stern when touring away from the shore to get back into the boat in the event of a capsized. Also think about lifejacket, bilge pump and other safety related equipment for trips like that.

## **Boat care, Transport and Storage**

### Boat care and storage

Let your NANOOK dry thoroughly after paddling. If it is dirty on the inside, you can rinse it with water. From the outside you can clean it with a damp cloth. Store the kayak dry and protected from UV radiation, preferably with the coaming downwards, so that it does not get dusty inside. Only close the coaming during storage when the kayak is absolutely dry. Depending on how often you paddle your NANOOK, you should from time to time re-oil the accessible wooden parts, especially the coaming and the seats with "OWATROL Deks Olje D1". If you re-skin the kayak after a longer period of time or after damage, I recommend to take the chance and re-oil the frame thoroughly

### Transport

For transport, you can strap it to your roof racks with the keel down, but you should not leave the straps tight for days to avoid deformation of the hull. I recommend a special kayak carrier for transport.

## **Thank You!**

I hope you had fun in the construction process and enjoy the finished kayak. Feel free to send pictures or experiences of the building process or the finished kayak, which I can also add in the customers gallery or the map on the webpage.

I am also always happy about a review!

[Leave a review on Google →](#)



### Note of the author

These instructions have been produced with the greatest care and to the best of knowledge, but the author cannot accept any liability in the case of accidents, injuries or material damage, even if these have occurred as a result of errors in this construction plan. The reader and self-builder is responsible for his own safety and should inform himself on his own responsibility with regard to dangers that may arise from the use of machines, tools and materials and take appropriate measures to prevent accidents and preserve his material goods.

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